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# THE EFFECTS OF EDP AND EDI ON TRANSPORT ORGANIZATIONS AND USERS

*Note by the UNCTAD secretariat*

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## Abbreviations

| | |
|---|---|
| ***ECE*** | Economic Commission for Europe |
| ***EDI*** | electronic data interchange |
| ***EDIFACT*** | electronic data interchange for administration commerce and transport |
| ***EDP*** | electronic data processing |
| ***ESCAP*** | Economic and Social Commission for Asia and the Pacific |
| ***FALPRO*** | UNCTAD Special Programme for Trade Facilitation |
| ***IATA*** | International Air Transport Association |
| ***IDEA*** | International Data Exchange Association |
| ***LAN*** | local area network |
| ***PC*** | personal computer |
| ***UNSM*** | United Nations standard message |

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# INTRODUCTION

(i) In its resolution 67 (XIV), paragraph 1, the Committee on Shipping requested the Secretary-General of UNCTAD to convene a group of experts to discuss developments in multimodal transport and containerization wherever there is a sea link, to take stock of the principal problems that are experienced by users and providers of multimodal and/or container transport operations and to suggest elements of a future programme of work for the Committee in the field of multimodal transport and containerization.

(ii) In order to facilitate the work of the group of experts, the Committee requested the secretariat to make available a series of studies on different aspects of multimodal transport, *inter alia* "a study on the effects of EDI and EDP on transport organizers and shippers, consignees, terminal operators and customs authorities of developing countries and obstacles they are facing with the introduction of EDI and EDP in co-operation with relevant organizations..."[1]

(iii) The present report has been prepared in response to this request. It draws on a number of recent papers dealing with the subject, including one by the Transport and Communications Division of ESCAP, entitled "Electronic data interchange (EDI) systems for transport related and trade facilitation activities", and summarizes its main findings. The ESCAP report is made available in English as a supplement to the present report.[2] Also taken into consideration is work done within the Economic Commission for Europe's Trade Division's working party on facilitation of international trade procedures (WP4) which deals *inter alia* with electronic data interchange (EDI).

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1 Report of the Committee on Shipping on its fourteenth session, (TD/B/C.4/336), resolution 67 (XIV), paragraph 3 (c).

2 ESCAP's documents are only available in English.

## *SUMMARY AND CONCLUSIONS*

1. Computerization or, as it is also known, electronic data processing (EDP) is now widely used within the transport industry. Even a small freight forwarder is likely to have a word processor and a simple accounting programme package for the printing of invoices or the preparation of bills of lading. This is quite different from the era before the personal computer (PC) became everyman's tool. In those days the mainframe or mini computers required were so expensive that only large companies could afford them. Having invested in expensive hardware, transport companies discovered a need for special software programmes to be written for their particular use. This process was often long, expensive and fraught with risks.[3] Smaller transport companies did not have the financial capability - or perhaps the need - to invest in such "fancy" equipment. So, while the larger companies sweated and persevered with the development of EDP, the smaller ones continued to operate, quite successfully, with manual systems.

2. During this process, however, the larger companies learnt useful lessons, and when the microcomputer revolution took off, they were well placed to take full advantage of the possibilities of electronic communications with their trading partners which the new equipment offered. They were, in other words, a way ahead of their competitors, namely, the small transport providers.

3. The larger transport companies thus began investigating the potential of electronic data interchange (EDI).[4] It allowed them to communicate electronically with their clients, their branch offices and agents. They were consequently able to offer a new - and higher - degree of services to their clients, just as the small transport providers were congratulating themselves with having "caught up" with the big ones through the installation of new PC's.

4. Competition between transport providers is today thus not so much between those from developed countries *versus* those from developing countries, but rather between those who offer full EDI services *versus* those who do not. In other words, it is the big *versus* the small. This problem is discussed in another UNCTAD paper which *inter alia* touches on the possible effect of the emergence of the so-called "mega carriers" and which is also made available to the Experts.[5] The possibilities created by EDP were highlighted almost four years ago in an article on the European freight forwarding and transport industry which stressed the necessity of investing in data processing equipment as "the only way freight forwarders can perceive of improving their profitability".[6] It would seem that this stage has now been surpassed by a need to invest in EDI equipment if companies are to stay in business.

5. From this situation some conclusions may be drawn:

   (a) If developing countries' transport providers are to thrive, they must take full advantage of both EDP and EDI, which means investigating in the appropriate amount of equipment. Indications are that the screen/person ratio should be at least 1:3, with the long-term goal of 1:1;

   (b) Developing countries' transport companies must provide adequate EDP training to all staff using EDP equipment;

   (c) Local training institutions should provide EDP courses particularly geared towards the transport industry through part-time or evening classes; and

   (d) A large number of "off-the-shelf" software packages for the transport industry exists. However, selection of the "right" software for transport providers and users must receive careful attention since the choice of inappropriate software may have serious economic consequences;

6. The ESCAP report referred to in the introduction states that: "the full benefits of EDI are only

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3 M. John, and D. Wright, "Impact of information technology on the methods and working systems of the freight forwarding industry", London/Washington D.C., *Maritime Policy & Management*, Volume 18, No. 2, April-June 1991, pp. 116-119.

4 EDI has been defined as "the computer-to-computer transfer of commercial and administrative transactions using an agreed standard to structure the data pertaining to that transaction".

5 *Practical problems faced by governments and commercial parties involved in multimodal transport operations to and from developing countries* (TD/B/C.4/AC.11/4).

6 "The central role of information technology in transport strategy", *Lloyd's List*, London, 9 October 1990, p. 8.

maximized when most or all of the active parties are linked into the system. With the adoption of EDIFACT[7] standards and the effort to optimize EDI systems, it would appear that in the long term, a global EDI system will be available. It is therefore essential that any initiative taken at this time will have the capacity for future connection to the global network. This dictates the use of international EDI message standards. Hence, the developers of EDI systems must consider strategic planning for electronic trading before embarking on detailed national or industry-based developments."[8]

7. The report continues:

"...the question of whether the introduction of EDI should begin with only one, some or all of the transport and trade facilitation activities depends largely on:

(i) The business and trading needs for EDI;
(ii) The availability of resources in terms of:

- Funding capacity;
- Telecommunications infrastructure;
- Computer hardware and software; and
- Technical expertise.

(iii) The cost and benefits to users."[9]

8. The conclusions end with the observation:

"...there is no single EDI system that could provide a role model which will be suitable for all countries...; each country has different trading needs, practices and economic conditions. However, those countries planning for EDI are in the enviable position of being able to learn from the pioneers and choose the best features of existing systems to arrive at a solution appropriate to the business needs and priorities of each country.

For the future, there will remain a global need for information on EDI developments so that countries embarking on EDI will be able to exploit the experiences of others in streamlining their own EDI development process."[10]

9. Decisions regarding the use of one type of EDI messages over another, particularly as they concern local (non-international) messages must be taken with careful regard to transmission costs and following careful determination of which data elements really need to be transmitted.

10. On the question of the relevance of EDI to the promotion of multimodal transport, the International Air Transport Association (IATA) has said that it supports proposals for inter-airline EDP exchanges because it has been demonstrated that "the key obstacle to effective use of air speed in origin-destination transport was a set of interlocking inefficiencies in the controlling of the information flow." "Origin-destination transport" is what multimodal transport is all about.

11. The Group of Experts may wish to take note of the present report and consider including in its proposals for the future programme of work of the Committee on Shipping, in the field of multimodal transport and containerization, an item on the development of EDP/EDI and its influence on developing countries.

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7 EDIFACT stands for Electronic Data Interchange For Administration, Commerce and Transport.

8 *Electronic data interchange (EDI) systems for transport related and trade facilitation activities*, New York, 1991, Report by the ESCAP secretariat (no document number), chapter 8, p. 57.

9 *Idem.*

10 *Ibid.*, p. 59.

## Chapter I

# ELECTRONIC DATA PROCESSING

12. The proliferation of EDP is no longer confined to developed countries. Its extension to developing countries may be less rapid, but it has nevertheless been considerable, although its influence is difficult to estimate. Before the introduction of PC's, EDP meant mainframe computers or mini computers. These were expensive tools which, compared with today, had only limited computing power. They were thus utilized mainly for a small range of tasks. Japanese shipping companies at the beginning of the 1980s, for example, used their computers to generate the following types of data:

(a) Business statistics;
(b) Cost analysis;
(c) Statistics on staff;
(d) Summaries of voyage revenues and expenses; and
(e) Budgetary data.[11]

The situation was similar in other countries. In other words, computers were operated primarily by and for the accounting department.

13. The last decade, however, witnessed a veritable explosion of computers in developed countries where their massive numbers have resulted in more and more tasks being "computerized". This explosion is now spilling over into developing countries where PC's are also becoming common, if not to the degree achieved in developed countries in which the screen/person ratio is moving towards 1:1. The lowliest scretary and the chief operating officer will each have their own screen and keyboard (but not necessarily their own computer).[12]

14. Initially, the introduction of EDP carried with it the fear that massive redundancies would result, and it was consequently resisted in many places. It is undeniable that certain jobs will be lost through the introduction of almost any new technology, but new technology also entrains new skills and higher-paying jobs. It was pointed out in an earlier UNCTAD report[13] that failure to adapt to a change in technology may have far worse impacts on the national economy than that caused by the addition to the pool of the unemployed of a relatively small number of persons made redundant by the new technology. Today this is certainly the case. Unless the many participants in trade and transport have the tools required for the conduct of day-to-day business, their trading partners will not deal with them. EDP should no longer be considered an enemy, but a saviour. However, it must be introduced and implemented wisely !

15. It would seem superflouous to detail the transformations wrought by the introduction, on a massive scale, of EDP; however, it may be useful to recall the main classes of costs of its introduction:

(a) Hardware (basically the cost of acquisition of terminals);
(b) Software (either off-the-shelf or commissioned by the user);
(c) Possible changes to offices, buildings, wiring because of the introduction of EDP;
(d) Possible rental of additional space (unlikely for PC's);
(e) Staff training and familiarization expenses;
(f) Communications costs (installation/rental of leased lines, etc.);
(g) Cost of disruption to staff, offices and clients during the installation of the new equipment **and during the running in of the new system/technology**.[14]

16. Software is often a major problem. While software houses are becoming better and better at writing appropriate software, the intricacies of tailoring a (possibly "off-the-shelf") programme to a

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11 Hideo Suzuki, "Physical Distribution Industries and Information System Revolution", *Shipping and Trade News*, Tokyo, 19 November 1982, p. 2.

12 Zim Israel Navigation Co., for example, has reached a ratio of 1:1.667 according to "Zim's life-blood flows through electronic veins", *Containerisation International*, London, May 1991, p. 78.

13 *International multimodal transport in developing countries. Issues and References* (UNCTAD/SHIP/156), paras 8-9.

14 Adapted from John and Wright, *op. cit.*, emphasis added.

specific user's requirements are often under-estimated. The same is normally the case for item (g) above. In some tropical climates, computers must be located in a cool, dry environment, possibly necessitating the installation of airconditioning equipment and perhaps making special efforts to reduce the amount of dust in the air. Likewise, voltage equalizers and battery packs may be required to protect data. These are, however, trivial problems that can be solved with relative ease.

17. The introduction of EDP in developing countries is thus somewhat more difficult than in most temperate developed countries, yet, as will be shown in chapter II below, without computers there will be a dramatic reduction in business opportunities. A remaining problem is the proper distribution of computers. They should not be locked up in the managers' offices; neither should the boss of the company feel that there is no need for him to become "computer literate".[15]

18. Implementation of EDP requires qualified staff and the necessary computer literacy must be obtained through appropriate training. Mastery of EDP is not something which can be accomplished during a couple of hours of instructions at even the best training institution. Proficiency is achieved only by long practice and sometimes "bitter experience" in front of a screen. The emphasis here is of course on "long" rather than "bitter". The time element and access implies that a company with only one PC at its disposal cannot have more than one or two individuals become sufficiently familiar with EDP to allow the company to benefit from the investment.

19. A few conclusions may be drawn from this. The first is that a single PC may be insufficient for a company which employs more than four or five persons. The second conclusion is that EDP training is of paramount importance. Even though the cost of EDP equipment has been shrinking, no organization can afford to leave its equipment under-utilized. It is consequently suggested that transport companies pay close attention to the EDP training aspects, and that national or local training institutions consider offering EDP training courses of increasing complexity. Fortunately, such training lends itself very well to part-time or evening study, and it should thus not be very difficult for employees of transport companies to attend EDP classes.

20. As regards the question of which areas of the company's activities would benefit from the introduction of EDP, the answer today must be "practically all". However, each area may require its own sofware packages. The accounting department will not use the package intended for container control, yet both the accounting and the container-control departments will need a common word processing package. The communications packages, whether for internal local-area-network (LAN) use or for EDI purposes, will also be common.

21. Appropriate software packages, correctly utilized, can have a very considerable impact on the economies of developing countries. An example would be the **Advance Cargo Information System** (ACIS), developed by the UNCTAD secretariat, under a technical assistance project for Africa. The main goal of ACIS is to provide information necessary to identify and examine problems caused by the poor management of transport chain logistics. ACIS is a software package which provides relevant advance, spot and statistical information on movements of cargo from port of loading to final inland destination, and of movement of associated transport equipment.

22. A subset of ACIS is its "Railtracker" module which enables national railways to track their wagons. If foreign wagons remain in another country, they are normally liable for a detention charge calculated for each day the wagon remains outside its country of origin. In Malawi, for example, through the use of Railtracker, wagon detention time has been reduced from five to three days and wagon turn-around time has been reduced from six to four days representing an improvement in wagon utilization of 50 per cent.[16] A similar reduction of detention time was observed by the Tanzania-Zambia Railway Authority (TAZARA) after the installation of Railtracker on that railway. Initial wagon turn-around time was reduced from 25 to 20 days.[17]

23. As for staff implications, the introduction of appropriate software will change the daily routines. In the pre-EDP days, railways often spent excessive time, for example, in transmitting data regarding wagon disposition. With a new computerized, linked system, this operation is reduced to a minimum

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15 It is assumed that companies that are large enough to require mini or mainframe computers have achieved a level of "EDP competence" that makes the suggestions in this chapter less relevant for them.

16 Letter dated 4 April 1991 from the Malawi Railways to the UNDP/UNCTAD Chief Technical Advisor in Blantyre reporting on the effects of the introduction of Railtracker in Malawi.

17 Letter dated 27 March 1991, from the Tanzania-Zambia Railway Authority to the UNDP/UNCTAD Chief Technical Advisor in Blantyre reporting on the effects of the introduction of Railtracker on TAZARA.

because data from individual stations can now be made immediately available at the central station. Instead of spending its time on menial tasks, the railway staff can to concentrate on more productive work, thus improving the efficiency of the company. The railways have reported that their image had greatly improved after the introduction of Railtracker.

24. Within ACIS a so-called "Harbour Master System" has been also developed. The Harbour Master System contains four sub-systems, a "Berth Planning Sub-module", a "Manifest Sub-module", a "Gate Pass Sub-module", and a "Port Statistics Sub-module" the use of which will improve the efficiency of any port which is not already using EDP as a means of improved management.

25. Another UNCTAD-developed software package is MULTISHIP, a software programme which assists liner shipping companies with the planning of new services or improvements to existing liner services. MULTISHIP facilitates the selection of liner shipping routes on the basis of commodities, trade requirements, port facilitiies, vessel types, cargo-handling techniques and other factors. Simulated routing systems like these are used by large liner companies, giving them a strong competitive advantage.[18] MULTISHIP allows smaller shipping companies to perform the same type of route analysis without having to develop an expensive proprietary computer programme.

26. Many other software packages exist for the transport industry. Within the shipping sector alone, the **Fairplay Marine Computing Guide 1990** contains more than 350 individual "off-the-shelf" software packages.[19] Many of these can be used without modifications by the purchaser. Transport organizations in developing countries might benefit from scrutinizing such lists for useful packages.

27. The development of EDP has made it possible to communicate electronically with clients. This has encouraged a closer carrier/customer relationship. This was discussed briefly in *Inventory of existing mandates and new draft programme of work in the fields of multimodal transport and technological development* (TD/B/C.4/323),[20] which will be before to the Experts.

28. In more and more countries EDP is becoming a necessity for companies having to deal with, for example, Customs authorities. The question of electronic filing with Customs is considered in chapter II. Here it will suffice to highlight the increasing number of countries which have or are in the process of acquiring yet another UNCTAD-developed software programme, *viz.*, the Automated System for Customs Data and Management (ASYCUDA). As of the autumn of 1991, some 40 countries or territories[21] had already installed or were in the process of implementing the system. Sixteen countries were negotiating projects installations while a further 37 countries had shown an interest in the system. If this interest is converted into implementation, Customs authorities in almost 100 developing countries will have embraced EDP. To take advantage of this new development, their "clients" must do likewise.

29. Some years ago it was stated that "without the aid of data processing equipment, shipping companies (no matter where they might be), will slowly but surely be forced out of the trades by their better-equipped competitors. No amount of cargo sharing will save the inefficient company where expenses continue to exceed income."[22] The same can be said for other transport providers, not to mention their clients: shippers and consignees.

30. At this point a word of caution may be appropriate. Cost savings derived from EDP are often over-estimated. As those familiar with EDP can attest, its introduction has not resulted in a reduction in the use of paper. On the contrary, paper usage has often shown a sharp increase. The expected staff reductions have often likewise proven illusory, however, the ease of correction of data-entry errors and

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18 See for example "Zim's life-blood flows through electronic veins", *op. cit.*, where it was said that "dozens of simulations were run by the planning experts to identify the optimum fleet schedule and marketing scenario," and where Zim was quoted, predictably, to have "declined to disclose details of its long-range planning and marketing positioning application," although the line "highlighted that computer-based real-time information enabled the company to attain optimal fleet deployment, enhanced flexibility, and quick response to changing market conditions", p. 79.

19 Fairplay Marine Computing Guide 1990, 20 Ullswater Crecent, Coulsdon, Surrey CR3 2HR, United Kingdom, Fairplay Publications, 1990.

20 Paragraphs 88-93.

21 Anguilla, Antigua and Barbuda; Bangladesh, Barbados, Benin, British Virgin Islands, Burkina Faso, Burundi, Cape Verde, Central African Republic, Colombia, Comoros, Dominica, El Salvador, Ghana, Gibralta, Grenada, Guatemala, Guinea, Haiti, Honduras, Madagascar, Mali, Mauritania, Mauritius, Montserrat, Netherlands Antilles, Nicaragua, Niger, Panama, Romania, Rwanda, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines, Sudan, Togo, Turks and Caicos, Zaire, and Zimbabwe.

22 Hans Carl, "Data Processing: the Ultimate Tool", *Containerisation International*, London, December 1982, pp. 78-81.

the elimination of multiple re-keying of the same data have created considerable savings and benefits. Efficiency in this area has freed staff to undertake new or formerly neglected tasks, thereby providing clients with an enhanced level of service.

31. Thus it is not so much through the introduction of EDP as through the introduction of EDI that a company may save money. EDI may also - finally - lead to a reduction in the amount of paper required in today's international trading and transport. Indeed, EDI is being heralded as the technology of the paperless society. This has yet to be proved.

## Chapter II

## ELECTRONIC DATA INTERCHANGE

32. In the course of an international trade transaction, many parties have to produce, check, transfer, receive, process and file hundreds of information elements relating to the goods, their transport and their payment. Such information transfer, traditionally carried out through filling in and transmitting paper documents, is slow, error-prone and costly. With the proliferation of computers and the use of tele-transmission techniques, it has become possible to rationalize the processing and transmission of information. This is normally called "electronic data interchange" or simply EDI. EDI is generally defined as: ***"the computer-to-computer transfer of commercial and administrative transactions using an agreed standard to structure the data pertaining to that transaction"***.

33. The concepts of EDI are now being introduced in all developed countries where a number of systems have been created, linking branches of the same company, counterparts in the same industry (for example, banks, airlines) or small groups of operational partners (for example, Customs and freight forwarders, Customs and airlines, container operators and sea carriers, etc.).

34. Under the auspices of the Economic Commission for Europe (ECE) a global system was eventually created through its Working Party No. 4 on trade facilitation. This Working Party has been instrumental in the development of a set of rules for electronic data interchange for administration, commerce and transport, which has become known under the acronym EDIFACT.

### *A. Implications for developing countries*

35. It has been said that "politicians...cannot afford to...widen the gap between developed and developing economies. You cannot throw advanced EDI bridges over that gap, without first setting up a supporting infrastructure of sound, simple procedures and documentation."[23] This was precisely the reason why the Committee on Shipping recognized "the need to avoid widening the gap between the developed and developing countries with regard to the implementation of multimodal transport and electronic data interchange."[24]

36. A few years ago the International Data Exchange Association (IDEA) published a discussion paper entitled "Electronic Data Interchange and Developing Countries".[25] This paper began,

> "Electronic data interchange (EDI), direct transmission of information between separate data-processing systems, by agreed standard messages, may seem an innocuous and somewhat technical activity. In practical fact, it is already revolutionising the movement of goods and money, in national and international trading, and will have much wider, deeper effects on commercial practices and government administration.
>
> In developed economies, including especially west European, American and Japanese markets, the ability to link individual computer systems for real-time information exchanges has reinforced the competitive advantages of multi-national business enterprises, underpinned "just-in-time" supply/distribution techniques, slashed inventory costs, multiplied transport options and greatly accelerated essential cash-flows..."[26]

37. An example of the consequences of a fully automated EDI environment - where trading partners have developed application software programmes which eliminate human decision-making with respect

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23 John Raven, "Electronic data interchange - an institutional crossroads", IDEA Discussion paper No. 3, Brussels, International Data Exchange Association, September 1988, p. 9.

24 Report of the Committee on Shipping on its fourteenth session (TD/B/C.4/336), resolution 67 (XIV), seventh introductory paragraph.

25 John Raven, "Electronic Data Interchange and Developing Countries", IDEA Discussion Paper No. 2, Brussels, International Data Exchange Association, 1988.

26 *Ibid.*, p. 1.

to particular transactions - can be found in a recent report published by the American Bar Association.[27] This report, which contains a model electronic data interchange trading partner agreement and a commentary on this agreement, gives as an example a situation where in company ABC, when inventory of a certain consumable item reaches a certain predetermined level, ABC's computer might automatically generate an appropriate purchase order, "including terms as to price, quantity and similar items pre-defined to be within the parameters of the business relationship" which the company has with company XYZ.[28] Similarly, XYZ's computer may be programmed automatically to accept any purchase order whose terms fall within predefined parameters. The report finds that "this process may be sufficient, if fully established, to permit ordering, shipping, invoicing and payment to occur electronically with human review and intervention, if it occurs at all, limited to supervisory summaries of daily activities."[29] The significance of this development is not difficult to grasp.

38. The implications for developing countries of the rapid development of EDI are extremely important, yet poorly understood. In spite of what has been said above (paragraph 35), competition is leading towards the imposition, by developed economies on developing ones, of a technology for which the majority of developing countries is ill-prepared.

39. The IDEA discussion paper cited above goes on to say:

> "Main third world requirements, at the present stage of EDI development are extremely modest in comparison with the benefits that both North and South can expect from timely, appropriate response. The urgent need is for information, contacts, expertise and encouragement.
>
> Unfortunately EDI enthusiasts - including the EEC Commision - seem to be hypnotised by the speed and scope of events in Europe, the US and Japan. None of the innumerable general and specialised EDI seminars which have proliferated in the last two or three years have mounted any worth-while examination of implications for the rest of the world.
>
> Lending and funding agencies have scarcely accustomed themselves to the recent switch of basic aid strategies from projects to programmes, and still tend to operate - and think - in terms of separate country, sectoral, or, at best, regional compartments...
>
> EDI is too recent a development to have reached the business schools, let alone the relatively few institutions which specialise in the transfer of knowledge and know-how from developed to developing countries. The result of all these factors is that the sort of information and contact flow which is needed cannot use the normal main channels of communication, influence and encouragement.
>
> There can be no doubt of the total balance of advantage for any developing economy. Resources are so scarce and international competition so demanding, that it would be simple folly to throw away any opportunity of optimising the use of computer systems in international trade, and, at the same time, improving internal business efficiency and administrative cohesion.
>
> For the world at large, it is now a truism that prosperity is indivisible. The cost gap between developed and developing countries, in terms of international trade procedures and documentation, is already wide enough. The latest EEC figures show that traditionally accepted on-costs represented by these requirements, of about 10 per cent of the average value of general cargo consignments, is now down, in intra-Community trade, to about 1.8 per cent...
>
> It is in no-one's interest that EDI should force developing countries even further down the ladder of competitive competence. Nor should the Community be the only focus of anxiety. Every lending and funding agency will find, on examining its current assistance programmes, that substantial and growing amounts in almost every economic sector, are being applied, quite rightly, to communications and computer projects. Insofar as these are being supplied and applied in isolation from understanding of EDI perspectives and principles, they could well turn out to be investments in incompatibility..."[30]

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27 *The commercial use of electronic data interchange - a report*, American Bar Association, n.p., 1990, (to be published in "44 BUS. Law.___").

28 *Ibid.*, p. 15.

29 *Idem.*

30 Raven, *op. cit.*, p. 7.

## *B. EDIFACT*

40. The UNCTAD report "Developments in multimodal transport" (TD/B/C.4/328), which is also before the Experts, contained a section on the developments of EDI.[31] The report highlights the development of EDIFACT and the increase in the number of EDIFACT Rapporteur Groups. It mentioned the possibility of a fifth EDIFACT Rapporteur Group being created in Asia. This happened with the appointment of a Japan/Singapore EDIFACT Board in 1990. At the September 1991 meeting of the Working Party of the Economic Commission for Europe's Committee on the Development of Trade on Facilitation of International Trade Procedures (WP4), this EDIFACT Board changed its name to the Asian EDIFACT Board, since China and the Republic of Korea had recently joined Japan and Singapore.[32] Taiwan, Province of China[33] participates in the Board's work as an observer.

41. Before the thirty-fourth session, in September 1991, of WP4, the development of United Nations Standard Messages (UNSMs), which are based on EDIFACT, had not been nearly as speedy as the industry had hoped. At the same time, there was in some quarters considerable scepticism as to the economy of converting current EDI standard messages to the EDIFACT format, owing to the possible increase in transmission costs thereof. This concern has been dealt with at some length in the ESCAP report which is being made available to the Experts with the present paper.

42. Fortunately, the thirty-fourth session of WP4 resulted in an appreciable speed-up of the process of message development, in that a total of 16 UNSMs receiving "Status 2" (messages released for practical use), 15 UNSMs received "Status 1" (messages released for trial) and 22 UNSMs received "Status 0" (messages under development). Over 40 additional messages are being prepared for UNSM Status 0. This will undoubtedly revive confidence in the EDIFACT process, although it still has some way to go before convincing the business community at large of the merits of EDIFACT in the standardization of EDI messages. In this connection it may be worth noting that a leading shipowner's representative recently observed that "a little more common sense is undoubtedly needed...everyone praises his own electronic data system as the most sophisticated and the most precise. Shippers...are now confronted with ten different EDI systems."[34]

43. In a recent commentary by the Hong Kong Trade Facilitation Council the implications of the development of EDIFACT for developing countries were described as disturbing, since, "there seems a chance that UN/EDIFACT could, without anyone's wishing it to do so, become the restricted preserve of the richer nations, with all this implies in the way of non-tariff barriers to trade."[35] The commentary continued:

> "...there seems a risk that in time the appointment of Rapporteurs could inadvertently take on a political tinge. Very obviously, the outstanding considerations in the appointment of a Rapporteur must be the competence of the candidate to fulfil his role, **and his access to extensive and at times costly support facilities.** This of itself restricts drastically the number of candidates that the Asia/Pacific can field. It would manifestly be unwelcome and unweildy for individual nations, or block of nations, to press their claims to Rapporteurship simply as a matter of either national prestige or economic aggression."[36]

44. This having been said, it may be useful to return to the the IDEA paper which ended:

> "The promotion of knowledge and use of EDI techniques and standards...in developed and developing countries, will...depend very largely on the judicious deployment of the relatively few Customs officers who have practical experience of the design and commissioning of computer systems.
>
> Customs attitudes have already had a profound influence on facilitation. Past experience shows that once Customs adapt their declaration forms to the UN lay-out key, the whole trading sector tends to move rapidly to adopt the entire aligned documentary system. Customs use of international EDI standards could exercise the same benevolent data dictatorship over commercial computerisation policies.

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31 *Developments in multimodal transport* (TD/B/C.4/328), paras. 10-39.

32 ECE WP4 GE.1, draft report of the forty-fourth session, para. 14.

33 In the Asian EDIFACT Board known as "China, Taiwan".

34 Andrew J. Abbott, Executive Vice President of Atlantic Container Line, as quoted in "Shipping must get back to essentials", *International Transport Journal, Overseas Digest*, Basel, No. 23, 7 June 1991, p. 2031.

35 "TFC NEWS", Hong Kong, Hong Kong Trade Facilitation Council, no 11/90, May 1990.

36 *Idem.*, emphasis added.

> At the broader intergovernmental level a widening circle of developing countries are sending occasional or regular delegations to the UNECE Facilitation Working Party.[37] Unobtrusive, but extremely valuable, on-the-spot advice on computerision and EDI is being supplied at many points by UNCTAD, through FALPRO and the ASYCUDA (Automated System for Customs Data) programme...
>
> The need to meet and discuss technical and managerial problems has been a major spur to the formation of the numerous EDI project groups now active in Europe and the USA. These countries have good institutionai structures and high concentration of expertise - advantages lacking in most developing countries where there may be very few institutions and experts of any sort, often feeling uncomfortably isolated.
>
> Bringing interested people together to focus on the flow of useful information from other countries, to relate separate EDI developments in particular sectors to broad likely perspectives, to discuss common problems and to seek joint objectives will be an essential element in any really effective promotional and educational campaign...
>
> Finally, no-one should underestimate the importance of a purely commercial stimulus. Many of the most important EDI developments, in Europe and the USA, have come from the entrepreneurial and technological efforts of competing, value-added networks and service suppliers. Their powerful resources of innovation and experience, might well be able to move quite a few developing countries into at least the foothills of EDI applications.
>
> It may seem unrealistic to urge these and other organizations to bring the essential principles of EDI to the many developing countries which though they might need such assistance, hardly present favourable conditions for really significant applications. On the other hand key international standards are, at least available and much useful experience of EDI applications is to hand.
>
> Computerization, in what must now be seen as a wastefully outdated form, is intensifying daily in almost every developing country, and as EDI grows in the rest of the world, the trade facilitation gap, already too large, could widen alarmingly."[38]

45. Harsh words indeed, yet the ESCAP report tends to agree with this assessment. Stressing that "there is a growing need for ESCAP countries to keep pace with these developments in order to maintain a competitive position in the international trade scene."[39] It goes on to say that "it appears that EDI is fundamentally a management issue. The limited success of current EDI systems in the transport sector is related to the lack of adequate planning and proper implementation of the systems rather than for technical reasons."[40] In this connection it is, however, well to remember that an executive of a large logistics provider recently said, "the most important thing is to provide quality of service, and you don't have to be large to do that. But for a customer whose business does require larger systems capabilities or more logistics skills...it is an advantage."[41] He continued, "you have to track...products...and provide recall within 48 hours. With the sophistication of users getting better all the time, they are looking for more sophistication among the providers."[42]

46. In case someone questions whether EDI is possible in developing countries at all, readers are reminded that airlines have been using EDI throughout the world for a number of years, even from the least developed countries, without this proving too difficult. It is thus not a question of whether EDI can be utilized in developing countries, but whether developing countries can afford not to spend considerable effort and money in this field.

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37 The forty-fourth session of WP4 in September 1991 saw eight developing countries participating (Brazil, Gabon, Nigeria, Republic of Korea, Saudi Arabia, Senegal, Singapore, and South Africa.)

38 Raven, *op. cit.*, p. 11.

39 ESCAP EDI report, *op. cit.*, p. 57.

40 *Idem.*

41 T. Scanlin, Vice President, Units Companies, as quoted in "GATX & Itel to merge their 3rd party units", *American Shipper*, Jacksonville, Florida, Volume 33, No. 6, June 1991, p. 9.

42 *Idem.*

### *C. Legal aspects of EDI*

47. One of the main problems, yet one that so far has received insufficient attention, is the legal aspects of EDI. Some work has been carried out in the development of "Interchange agreements". The most important to date are:

(a) The European *Model EDI Agreement*;
(b) The American Bar Association's *Model Electronic Data Interchange Trading Partner Agreement*; and
(c) The EDIA *Standard Interchange Agreement*.[43]

Comments have also been made by the United Nations Commission on International Trade Law (UNCITRAL) on this subject.[44] These model agreements are intended "to govern the rules of conduct and methods of operation between the parties in relation to the interchange of data by teletransmission for the purposes of or associated with the supply of goods and/or services."[45] The subject is, however, a delicate one, and the legal rapporteurs of ECE WP4 have so far not been able to come to a final position.[46]

48. Another important subject is that of "Negotiable documents". In dealing with this issue, WP4 decided that the objectives "may be to ensure a series of procedures which, by agreement (whether in the form of an interchange agreement, user manual or statute or regulation), serves to achieve the same symbolic function as that which may be achieved in a paper-based environment by the use of certain words, signatures and related actions (for example, the transfer of possession)".[47] A distinction must, however, be drawn between "those commercial arrangements between familiar parties (which is the predominant situation in which EDI applications are currently being implemented) and arrangements between strangers."[48] The legal rapporteurs to WP4 considerered that further investigation of this subject would have to be undertaken. It is possible that a solution may be proposed during the course of 1992.

### *D. Example of practical use of EDI*

49. It may be useful here to give an example of how and where EDI may assist developing countries. One application could be, for example, to the process of receipt and delivery of containers at a port terminal. In order to speed up this process, a number of documents must first be standarized, and the data elements that are required by each party must then be identified. Once this has been done, an EDI message can be constructed. However, in view of the relatively few data elements to be transmitted, it may not be necessary to use a full EDIFACT message structure to transmit these between the terminal and the various users. What is necessary, however, is that appropriate translation software is available to receive data via third-party networks. Translation software that can convert local messages into the appropriate UNSM is also required.

50. The main reason for not simply using a UNSM is that these messages, in specific cases such as the one suggested above, may contain much unnecessary information, the electronic transmission of which will be relatively expensive. It has, for example, been reported[49] that an Australian container terminal-developed message was: "one quarter to one third the size of an EDIFACT message which means an EDIFACT message involves three or four times the cost of ours."[50]

51. Another example of EDI usage may be that of information concerning railway wagon locations

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43 EDIA stands for the Electronic Data Interchange Association of the United Kingdom.

44 UNCITRAL document "Electronic data interchange" (A/CN.9/350).

45 Standard Interchange Agreement, The EDI Association of the United Kingdom, introduction.

46 *Legal aspects of trade data interchange*, (TRADE/WP.4/R.781), p. 10.

47 "Legal aspects of trade data interchange" (TRADE/WP.4/R.781), para 12.

48 *Ibid*, p. 5.

49 John Spiers, "New truck identification system streamlines documentation for transfer of containers", *Daily Commercial News*, Sydney, 2 October 1991).

50 *Ibid*, quoting Joe Corcoran, Conaust Manager, Customer Services.

in connection with the use of ACIS. In some developing countries, the telephone network may be unreliable, and it may be simpler and safer to transmit data via an INMARSAT satellite even within one country. Connection to a satellite does not come cheap, however; consequently it has been suggested that potential users of EDI carefully scrutinize their data transmission on a "need to have" rather than a "nice to have" requirements basis[51] whether they "just" use commercial carriers for local messages, or use satellites.

### *E. Potential cost benefits from the use of EDI*

52. At the early stages of the introduction of EDI, cost savings may not be apparent; however, in one of the most advanced application of EDI, that of the recently-introduced system for paperless terminal receival and delivery of containers in Australia, some savings were immediately identifiable. This system, which has virtually eliminated paperwork associated with the export of containerized cargoes, allows the port terminal to save a considerable amount of idle time of their employees. It has reduced or even eliminated trucking queues, and has allowed exporters to negotiate their bills of lading up to 24 hours earlier than was possible before the introduction of the system.[52] A one-day saving in the negotiation of bills of lading can translate into considerable direct benefits through earlier payment by the banks to the exporter. Elimination of truck queuing will also lead to a cost reduction, since fewer trucks will be required to carry out the same task. The elimination of paper and of re-keying of data will save clerical costs.

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51 "Standard documents and common procedures leading to the introduction of EDI for the receival and delivery of containers", n.p. (Sydney), produced by the Australian Working Group on EDI, mimeographed, September 1990, p. 14.

52 See "The paperless port - how trucks will benefit", *ATN - The Management Magazine for Transport Operators*, Sydney, September 27, 1991, pp. 37-38.

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Item 2 of the provisional agenda

# DEVELOPMENTS IN THE FIELD OF CONTAINER STANDARDS

*Report by the UNCTAD secretariat*

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## Abbreviations

| | |
|---|---|
| *APC* | American President Company |
| *BR* | British Railways |
| *CEN* | European Committee for Standardization |
| *COFC* | Container on flat car |
| *ESCAP* | Economic and Social Commission for Asia and Pacific |
| *ECE* | Economic Commission for Europe |
| *ECMT* | European Conference of Ministers of Transport |
| *GBP* | Great Britan pound |
| *IICL* | Institute of International Container Lessors |
| *ICHCA* | International Cargo Handling Co-ordination Association |
| *IMCO* | Intergovernmental Maritime Consultative Organization |
| *ISO* | International Organization for Standardization |
| *TC 104* | Technical Committee 104 - "Freight Containers" |
| *TOFC* | Trailer on Flat Car |
| *TEU* | Twenty-foot equivalent unit (container) |
| *USD* | United States dollar |
| *WG 4* | Working Group 4 - "Future Containers" |

## INTRODUCTION

(i) The Committee on Shipping at its fourteenth session adopted resolution 67 (XIV) "Multimodal transport including work programme".[1] In the programme of work in the short term the UNCTAD secretariat was called upon "to monitor trends in multimodal transport and containerization and the technological developments in these fields, and to keep Governments abreast of such developments". The Committee also recognized the need to avoid widening the gap between the developed and developing countries *inter alia* with "the use of larger than current ISO standard containers". It instructed the UNCTAD secretariat "to take part in the meetings of the International Organization for Standardization's Technical Committee 104 (TC 104), in order to monitor the developments concerning the "new generation" containers, and to ensure that developing countries' views are adequately taken into account."[2]

(ii) At the same session, the Committee on Shipping further requested the secretariat to study the trends in the change of dimensions of containers in use and the impact of the introduction of such new container dimensions on the economies of the developing countries, taking into account the interests of all concerned parties. The study should include an economic, social and environmental analysis and evaluation of possible costs and benefits which might result from the introduction of such containers. Pending the completion of the study, the Committee expressed reservations about the introduction of non-ISO standard containers.[3]

(iii) The present report has been prepared by the secretariat in response to these requests. The report is based on information which has been collected by the secretariat through desk studies supported by input from different organizations, especially from the Economic and Social Commission for Asia and Pacific (ESCAP), which has recently published a study on the policy options for the inland transportation of non-ISO containers.[4]

(iv) The Committee on Shipping requested the Group of Experts on Multimodal transport to discuss developments in multimodal transport and containerization wherever there is a sea link, to take stock of the main problems experienced by users and providers of multimodal and/or container transport operations and to suggest elements of a future programme of work for the Committee in the field of multimodal transport and containerization. Taking into account the importance of container dimensions in multimodal transport development, the present report will be before the Group of Experts for consideration.

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1 Report of the Committee on Shipping on its fourteenth session (TD/B/C.4/336).

2 Resolution 67 (XIV).

3 *Idem.*

4 "Policy options for the distribution of maximum dimensions ISO containers", ESCAP report. Bangkok, July 1991.

## SUMMARY AND CONCLUSIONS

1. The present international container standards concerning dimensions and ratings, elaborated by the International Organization for Standardization (ISO), reflect a fair balance between the different technical, safety, operational and economic requirements of marine, rail and road transport. Wide voluntary acceptance of these standards has been confirmed by the increasing homogenity of the world container stock, which is the basic element of modern multimodal transport service.

2. The spirit of the ISO policy on container standards - constancy - and the worldwide application of these standards should be maintained, so that the operators and manufacturers throughout the world have confidence in standards. For the long-term development of the industry it is essential that the standards remain stable.

3. The use of containers larger than the ISO standard may be economically justified and advantageous in some trades. However, proliferation of the number of standard sizes may be more damaging in terms of the efficiency of transport operations than the use of a standard which may not completely satisfy all users. Experience has shown that the introduction of larger containers, as a rule, requires massive additional investments in rolling stock and infrastructure. This has an impact on the cost of operation and, in the end, usually leads to higher freight rates. Thus, the final effect of the introduction of larger containers may be quite the opposite to the objective desired.

4. The adoption of 9-foot 6-inch high containers as an international standard was not justifiable. Though containers of this height have been gaining in popularity, with a share in the total world container stock of over six per cent, this fact in itself cannot justify the designation of this dimension as an international standard. Carriage of such containers in containerships generally leads to some loss of total carrying capacity; inland transportation of such containers raises many problems and is often impossible. In the inventories of carriers and lessors containers of this height continue to be considered as special. Because of infrastructure constraints there is at present no prospect for 9-foot 6-inch high containers finding universal acceptance.

5. Containers longer than ISO standards are, in general, in use in specific trades with high-volume, low-density cargo. There is as yet no universal need for these containers and there would seem to be little prospect of their being generally adopted in the near future. Furthermore, there are some indications that the markets where such containers are in demand, have approached saturation. Orders for such containers have been declining. There is thus no rational basis for recognizing them as a universal international standard.

6. An example will illustrate the potential economic effect of introducing containers that are longer than the ISO standards. The present maximum length of ISO containers is 40 feet. Container cranes have been built to accommodate such containers between their legs. If a port must convert its cranes to accept 45-foot, 48-foot or 53-foot containers, cranes have to be rebuilt (at best) or replaced (at worst). The cost of a new quay gantry crane is approximately USD 5-6 million. In order to be equipped with just four cranes a port would thus have to spend USD 20-24 million in scarce foreign exchange without any real hope of being able to recover the cost of the obsolete cranes built to handle 40-foot containers.

7. At the sixteenth session of the ISO Technical Committee 104 (May 1991) the Technical report "Future wide-body containers", with new empirical container dimensions that are incompatible with the existing container systems and which go beyond most existing infrastructure limits, was rejected; this is indication that these dimensions for the new-generation containers were not acceptable to the transport industry. The proposed dimensions are not reconciable with regional and worldwide requirements for container dimensions

based either on more generous road-traffic regulations or on the advantages provided by the efficient accommodation of locally used pallets. Unlike the existing ISO container standards, there are no prospects for the universal acceptance of the proposed increase in standard sizes.

8. These considerations imply that, at the moment, it would not be possible to reconcile regional standards based on specific requirements with the present worldwide ISO standards on containers. The international container system should continue to use the present ISO container dimensions. At the same time, nothing prevents regional and specific trade using other contaner dimensions for economic considerations. This is done, for example, in the case of intra-European combined transport, based on containers and swap-bodies permitting more efficient stowage of pallets of the dimensions prevailing in the region. It is also the case in the United States where domestic containers of bigger dimensions have become possible since the introduction of more permissive road regulations.

9. Many developing countries have only recently introduced containerization. They have invested heavily in both equipment and infrastructure to handle ISO containers. Holding stable the present basic dimensions of ISO standard containers will maintain confidence in the development of multimodal transport services based on these standards. For their domestic trades as well as for the trades between developing countries they do not need bigger containers. If, however, under pressure from operators seeking to introduce such containers, non-ISO containers enter developing countries, it would be logical if the cost of adaptation of their transport systems for handling such non-standard containers were borne by these operators.

10. The monitoring of developments in the field of standardization of containers has permitted the UNCTAD secretariat to draw the attention of ISO to the needs and requirements of developing countries in this area. At the same time, this activity has led the transport industry to recognize the need to have stable internationally-recognized and voluntary-accepted container standards. Based on information set out in reports prepared by the UNCTAD secretariat,[5] the Committee on Shipping in various resolutions[6] has drawn the attention of ISO to the negative technical and commerical consequences, for developing countries, in particular, of continuing increases in dimensions and maximum gross mass of containers.

11. Owing to the limited participation of developing countries in ISO meetings, the UNCTAD secretariat was expressly requested by the developing countries to liaise between them and ISO so as to represent their interests, especially in TC 104.

12. UNCTAD's activities in this field have thus contributed to the awareness among all interested parties that the problem of container standards has acquired growing political significance. The question that is now being debated is not what the future container dimensions should be, but whether there is any need for a new worldwide container standard at all. This has been confirmed by the growing homogenity of the world container fleet based on the present ISO container dimensions as well as by the fact that there is no noticable proliferation of bigger-than-ISO-standard containers in trans-continental trades.

13. The Group of Experts may wish to urge developing countries to participate more actively themselves in future ISO meetings so that their views concerning container dimensions and standards may be directly considered by TC 104. The UNCTAD secretariat stands ready to continue its support to developing countries in this area and transmit recommendations in this respect to the Committee on Shipping. The Group may thus wish to keep this activity in the UNCTAD programme of work in the field of multimodal transport and containerization.

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5 TD/B/C.4/270, TD/B/C.4/302, TD/B/C.4/314, TD/B/C.4/329.

6 Resolutions 55 (XI), 60 (XII), 61 (XIII), 67 (XIV).

### *I. Homogenity of the world container stock*

14. Containers are the most important element in modern door-to-door transport service. Stability of the internationally agreed container standards is vital for safeguarding investments made in all links of the multimodal transport chain.

15. Statistics of the world container stock indicate that a high degree of homogenity of the world dry-cargo container fleet in relation to container dimensions and ratings have been maintained from the beginning of containerization on the basis of standards elaborated and adopted by ISO. This homogenity has been spreading constantly, reflecting the wide, voluntary acceptance by the transport industry of the existing ISO container standards. The most important of these standards from the point of view of intermodality is ISO standard 668, defining classification, external dimensions and ratings (maximum gross mass) of the series 1 freight containers. The essential parameters of the present ISO standard 668 have not been changed since their introduction in 1964. This fact has provided favourable conditions for development of containerization and the growth of multimodal transport operations throughout the world.

16. By mid-1990, more than 90 per cent of the world dry-freight container stock consisted of 20- and 40-foot long and 8-foot 6-inch high ISO standard containers (see table 1).

**Table 1**

Share of 20- and 40-foot long 8-foot 6-inch high containers
*(In real units)*

| | 1978 | 1980 | 1983 | 1986 | 1990* |
|---|---|---|---|---|---|
| Total number of containers | 1,307,497 | 1,917,752 | 2,991,998 | 3,623,092 | 5,102,563 |
| 8'06" × 20' and 40' units | 880,631 | 1,407,315 | 2,542,949 | 3,198,420 | 4,710,255 |
| Per cent of total | 67.3 | 73.4 | 84.6 | 88.2 | 92.3 |

***Note:*** For 1990 the figures are in TEUs. Only dry-freight containers (excluding thermal, tank, flatrack and other types of special containers) were taken into account.

***Source:*** Computed from the censuses carried out by *Containerization International* in 1978, 1980, 1983 and 1986, and by *Cargoware International* in 1990.

17. The sample study on the composition of the new container additions entering the industry, carried out by the UNCTAD secretariat[7], also confirmed that the vast majority of newly manufactured containers corresponds to the present ISO 668 standard as regards dimensions and ratings.

18. Stability of container standards has always been one of the main concerns of the UNCTAD Committee on Shipping in its work on multimodal transport and containerization. As long ago as the end of 1972, the United Nations/IMCO Conference on International Container Traffic, in its resolution No.4 on Container Standards for International Multimodal Transport, invited the Economic and Social Council to consider the practicability of eventually drawing up an international agreement on container standards. On the question of the eventual international agreement on container standards, further discussions revealed a profound difference in the positions of developed and developing countries in this regard.

19. Developing countries, supported by the group of eastern European countries, advocated the necessity of a flexible international agreement establishing an equitable and efficient regime for the evolution and application of internationally agreed container standards. These countries held the view that such a regime would better protect investments in the containerization of their trade made at great capital cost. Conversely, developed countries expressed the view that there was no need for such international agreement and that the existing institutional framework of ISO was

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7 TD/B/C.4/329.

quite satisfactory. Moreover, they stated that there was a danger of impeding technical progress by means of a binding document which might prove difficult to amend.

20. While agreement could not be achieved on this point, as a result of long discussions, resolution 22/1978 was adopted by the ISO Council, which requested the widest possible consultations over proposals for revisions of the ISO 668 standard which affected compatibility, intermodality and modularity of ISO containers. At the same time, the question of container standards was remitted to the UNCTAD Committee on Shipping for regular review.

## *II. Use of non-ISO standard containers*

21. Previous UNCTAD secretariat reports[8] have described containers with characteristics not corresponding to ISO 668 standard as well as statistics concerning their use. First of all, these descriptions concerned high-cube 9-foot 6-inch (2.9-metre) high containers of standard length and width. Then came 45-foot long high-cube containers used in maritime transport, along with 48 and 53-foot long 8-foot 6-inch wide and 9-foot 6-inch high containers used almost exclusively in the United States domestic trade.

22. Though non-ISO standard containers have always been used by certain operators, such containers have appeared for reasons of economy of scale, since their use has become possible because of changes in local regulations concerning the dimensions of transport means, especially road vehicles. They have been principally introduced in specific trades for the carriage of high-volume, low-density cargo. The UNCTAD secretariat reports mentioned above (para 21) also referred to the difficulties raised by handling non-ISO containers in ports and terminals and their carriage by inland means of transport, especially in developing countries. For these reasons it was concluded that it would be premature to incorporate new (larger) container dimensions into the ISO standards.

23. Most non-ISO standard containers are high-cube 9-foot 6-inch high containers with standard length and width characteristics. Because these containers have the same base dimensions, they pose few problems during sea transportation by existing containervessels. However, in ports, and especially during inland transportation, their handling and movement are often limited or even impossible. Consequently, in inventories of lessors and carriers these containers are considered as specials.

24. Table 2 shows the relative growing popularity of high-cube containers. This growth was especially noticable in the period from 1986 to 1990. High-cube containers have been acquired both by carriers and lessors, although somewhat more reluctantly by the latter. In 1990, the share of high-cube containers in the lessors' fleets was half the share of such containers in the carriers' fleets. The overwhelming majority of high-cube containers in the middle of that year belonged to the North American owners, followed by Asian (Japanese and Taiwanese) and west European owners.

25. In contrast to this, there has been no significant proliferation of containers with length not corresponding to ISO 668 standard (in particular 45- and 48-foot long containers). Their total number in the world dry-freight container fleet, according to 1990 *Cargoware International* census, was 81,298 TEUs or 1.59 per cent. According to the previous census, made in 1986, their share was 0.84 per cent. The recent data[9] on delivery of newbuildings have revealed a slackening of demand for 45-foot long containers from the peak of 1987/1988. In 1988, some 11,500 45-foot containers were constructed; in 1990 this figure had declined to 5,000. It is estimated that fewer than 1,000 units were produced in the first half of 1991. In the production of one of the biggest plants in the Republic of Korea, (185,000 TEUs planned for 1991), only 1,000 or 0.5 per cent were expected to be non-ISO 24- and 45-foot containers.

26. The 45-foot containers were first introduced by the American President Company (APC) in 1982. At present, one-third of 45-foot containers are either owned or leased by this company. The remainder are in the hands of operators also engaged in trades connected with the United States

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8 TD/B/C.4/302, TD/B/C.4/314, TD/B/C.4/329.

9 *Cargoware International*, May 1991, pp. 27 - 29.

**Table 2**

Proliferation of 20- and 40-foot long 9-foot 6-inch high containers
*(In real units)*

| | 1978 | 1980 | 1983 | 1986 | 1990* |
|---|---|---|---|---|---|
| Number of 9'06" × 20' and 40' containers | 11,701 | 20,865 | 43,700 | 95,240 | 310,050 |
| Per cent of total | 0.89 | 1.09 | 1.46 | 2.62 | 6.07 |
| Growth rate | 1.00 | 1.78 | 3.73 | 8.14 | 26.5 |

***Note:*** For 1990 the figures are in TEUs. Only dry-freight containers (excluding thermal, tank, flatrack and other types of special containers) were taken into account.

***Source:*** Computed from the censuses carried out by *Containerization International* in 1978, 1980, 1983 and 1986, and by *Cargoware International* in 1990.

(among them, Sea-Land, with 20 per cent, and Maersk Line, with 15 per cent).

27. Non-marine 48- and 53-foot long containers are completely in the hands of United States operators and lessors. They are gaining in popularity in domestic transportation, but several hundred 48-foot containers have been built to marine specifications. The largest owners of such containers are APC and different railways. About 30 per cent are owned by the leasing companies Genstar and Transamerica.

28. To meeting the demands of shippers, operators are introducing containervessels permitting the carriage of containers of different sizes. Such is the case of some short-sea/feeder class vessels, the versatile design of which permits the accommodation of 45-foot containers as well as standard 20, 30 and 40-foot units. The same vessels can also carry standard-width containers and those with a width of 2,500 to 2,600 mm as well as different heights (from 8-foot to 9-foot 6-inches). There are also examples of larger, newly-constructed ocean-going containervessels, specially designed to carry longer-than-ISO containers as a part of their usual container cargo. It should be borne in mind, however, that existing containervessels have been constructed to carry containers matching the present ISO-standard; hence the cost of their adaptation for carriage of larger containers may be prohibitive. Although non-ISO standard containers are occasionally carried on the deck of containervessels, the carriage of such containers in containerships may lead to some loss of carrying capacity.

29. Inland transportation and handling in ports of non-ISO containers has almost everywhere been connected with problems and has sometimes been impossible. At the session of the UNCTAD Group of Experts on the Development, Improvement and Operation of Ports (September 1990) the question of oversized containers was raised many times by the representatives of different ports. In their recommendations the Group of Experts, most of whom were from developing countries, expressed deep misgivings about the changes underway in the dimensions of containers. It was noted that even the high-cube containers with the base geometry corresponding to the current standards raise problems of handling and carriage.[10]

30. ESCAP has recently undertaken a study to define policy options for the inland transportation of high-cube, oversize and overwidth containers in the countries of the Asian region.[11] The report makes "general statements on problems to be encountered" in the handling, storage and inland transport of non-ISO containers which, in general, are valid not only for ESCAP countries, but for many others and especially for developing countries.

31. From these statements, it follows that in relation to port operations, a great deal of equipment may become obsolete or lose a substantial part of its productivity when the necessity of handling non-ISO containers, especially over-long containers, arises. Such equipment includes quay-side and yard gantry cranes, straddle carriers, trailers, fork-lift trucks and reach stackers. Non-ISO containers also create problems in the pattern of spacing of containers in terminals be-

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10 TD/B/AC.7/12.

11 E/ESCAP/STC.13/3.

cause they require more surface and cannot be stacked according to the usual pattern of spacing based on the modular dimensions of standard containers.[12]

32. The report refers to many problems connected with the road transport of non-ISO containers in ESCAP countries where, as elsewhere in the world, the physical and legal limitations often make this transport impossible. Safe transportation of longer containers on existing vehicles and trailers cannot be ensured because they cannot be properly fastened. Transport of high-cube containers requires the use of special low-bed vehicles and, therefore, additional investments. Furthermore, in road transport an extension of the maximum width beyond 2.50 metres in many countries would not be acceptable, given the fact that this width has been used as the parameter for establishing the safety distance in highway engineering.

33. Rail transportation of non-ISO containers is not possible without costly adaptations of rolling stock and infrastructure. This applies to both high-cube containers with standard base dimensions and the longer, wider containers. Even the railways in Europe have to make special arrangements for the transportation of high-cube containers. When a railway uses wagons capable of carrying three 20-foot containers for transportation of 45-foot containers, this leads to a 25 per cent loss of traffic capacity and makes transportation more expensive.

34. Acquiring specialized low-bed platforms for the carriage of higher and wider containers means significant additional costs. For example, one TEU slot on new low-bed rolling stock of the British Railways (BR) will cost GBP 35,000 as compared to GBP 20,000 per TEU slot for the present modern rolling stock used for the carriage of ISO standard containers. Low-bed wagons with wheels of a smaller diameter will have a shorter service life and will require more maintenance and high repair costs. Moreover, wheels of a smaller diameter will cause more wear and damage of rails than wheels of the usual diameter. As to the cost of adapting the loading gauge for the British Railways, a figure of between GBP 600 million and GBP one billion has been quoted.[13]

35. When considering the above-mentioned report at its thirteenth session (17-21 December 1990), the ESCAP Committee on Shipping, Transport and Communications, while admitting that technological advances and trade requirements might make the introduction of a new generation of over-sized containers inevitable, nevertheless cautioned that special attention and care would have to be exercised in drawing up conclusions, particularly in view of the social and economic impacts of their introduction. The Committee stated that a number of developing countries had just introduced containerization and had invested heavily in both equipment and infrastructure for handling ISO containers. They could ill-afford to make further additional investments required by the introduction of over-sized containers in the present economic and financial climate and at the time when they were in the process of consolidating their containerization developments.

36. Another regional feature is the spreading use in Europe and in short-sea traffic of "standard" and "cellular" type 2.5-metre wide containers, adapted for the side-by-side accommodation of the European railway pallets. In many respects these containers comply with ISO standards, except for their width and stacking parameters. The "cellular" type is compatible with the cells of containervessels operating in certain European trades. Though their total number in the world container fleet is still very small (about 30,000 TEUs in mid-1991), big orders have been placed by some operators, indicating that 2.5-metre wide containers will have a certain future in regional and coastal trades. Recent tests of these containers in Australia and in the Republic of South Africa have confirmed these prospects.

## *III. Possible advantages from the use of non-ISO containers*

37. Larger containers have been introduced by the industry in order to meet the market requirements with a view to transporting low-density manufactured products. The ESCAP report mentioned above has indicated that, despite the many problems and disadvantages, the use of non-ISO

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12 In this respect, at the International Cargo Handling Co-ordination Association (ICHCA) seminar entitled "The intermodality of Future Containers" in February 1991, in relation to the impact of larger container dimensions on inland container terminals, it was stated that in case "a mixture of sizes are to be utilized, rather than the current limited number of ISO sizes, the cost of a depot's overall services may rise by 20 per cent for no real increase in container throughput."

13 *Cargo Systems*, March 1991, p. 57.

containers could also have certain advantages because, in the case of larger dimensions, for the same amount of cargo fewer containers will be required. This may lead to:

(a) Reductions in port handling charges per unit of cargo;

(b) Savings in energy consumption and air pollution because of the reduction of number of movements of containers;

(c) Less road congestion in the port area;

(d) Reduction of documentation and administrative expenses.

38. The ESCAP report contains certain information on the economic efficiency of the use of bigger than ISO-standard containers for operators and shippers. The analysis of economic efficiency has been calculated on the basis of data submitted by actual operators.

39. From these calculations it follows that for ocean carriage in the United States - South-East Asia trade, shippers attain 10 per cent economy in relative freight charge per cubic metre when using 45-foot high-cube container instead of the 40-foot standard container. The relative economy becomes 35 per cent in comparison with the use of the standard 20-foot container. The report also provides comparative data regarding inland transportation in different types of containers from the port of Seattle to various inland destinations in the United States by rail (see table 3). As may be seen, the option with the use of 45-foot containers is the most economical from the point of view of capacity utilisation.

**Table 3**

Comparative rates for transportation in different types of containers

| Destination (From the port of Seattle) | 20-foot | 40/45-foot | 20/40/45-foot |
|---|---|---|---|
| | COFC | | TOFC |
| Denver | 100 | 105 | 126 |
| Chicago | 100 | 119 | 191 |
| Detroit | 100 | 121 | 179 |
| Minneapolis | 100 | 105 | 144 |
| Kansas City | 100 | 126 | 146 |
| Memphis | 100 | 126 | 148 |
| Dallas | 100 | 120 | 144 |
| Kearney | 100 | 106 | 136 |
| Atlanta | 100 | 112 | 144 |

*Note:* 1. The rates are relative to the lowest rate set at a value 100 for 20-foot container carried by rail. All rates include drayage from the terminal to the rail ramp and final delivery from the rail ramp at the point of destination.

2. COFC - Container on flat car, TOFC - Trailer on flat car.

*Source:* *Policy Options for the Distribution of Maximum Dimension ISO Containers*, ESCAP report, July 1991.

## *IV. Developments in the field of standardization*

40. Work on the standardization of general-purpose dry-freight containers used in sea, road and rail transport with a world coverage is carried out in the ISO Technical Committee TC 104. In line with the declared ISO policy of maintaining a high degree of stability of container standards, the only significant changes incorporated into the ISO 668 standard since its inception in 1964 have been the introduction of 8-foot 6-inch high containers and the increase to 24 tons of the maximum gross mass of 20-foot containers. Although these were important modifications, they did not affect the intermodality or interchangeability of standard containers.

41. At its London meeting in 1989, TC 104 decided to recognize the height of 2.9 metres (9 foot 6 inches) for 30- and 40-foot containers. The pressure to recognize this height as a standard had

been considerable and sustained. However, noting that inclusion of a new height would constitute a new dimension under resolution 22/1978, and taking into account the concern that had been expressed on many occasions, the central secretariat of ISO postponed further action on this proposal. It requested TC 104 to prepare a comprehensive report and evaluation showing that these amendments were in the common interest of all parties concerned. This report would be drawn to the attention of all ISO members and competent United Nations bodies and only after such consideration would a decision be taken.

42. A report of this nature would be especially opportune, taking into account the very serious opposition to the introduction into the ISO standards of the height 9 foot 6 inch and the very slight majority which had supported this proposal within TC 104. High-cube containers raise problems with regard to height limitations in inland transportation in many countries of the world. This finding has been reflected also in the UNCTAD secretariat document TD/B/C.4/329. Unfortunately, the ISO report was never submitted, and at its sixteenth session in May 1991, TC 104 adopted a resolution confirming the introduction of an additional container height of 9 foot 6 inches into the ISO 668 standard. This decision goes contrary to the requirements of developing countries, and they did not support it within TC 104. The infrastructure of many countries cannot accomodate such containers because of limitations of their inland transport systems and there is no prospect of containers of such a height finding universal international use.

43. Besides the trend towards larger containers, ISO is also considering a proposal to upgrade the standard rating of 20-foot container from a newly increased 24 tons up to 30 tons, that is the present standard rating of the 40-foot container. This would permit more efficient loading of containers with high-density cargo. Moreover, certain manufacturers have already been producing 20-foot containers with a 30-ton rating. This applies especially to 20-foot tank containers and specialized containers for bulk cargo.

44. However, heavy (and in fact overloaded) containers have already caused many problems, and not only for the transport infrastructure of developing countries. The Institute of International Container Lessors (IICL) has reported that even 20-foot containers rated at 24 tons have difficulty with bridge and highway limitations when filled to the maximum gross mass. Experiments carried out in the United States have led to a recommendation that 20-foot containers be held to a cargo weight of 37,000 pounds (16.8 tons) and 40-foot containers be limited to 44,000 pounds (19,95 tons), whenever they are destined for intermodal movement on highways in the United States. The problems in developing countries, where road surfaces and rail tracks are often in poor condition, could be much more serious. Beside the damage to the transport infrastructure and the consequential growth of maintenance and repair expenses as a result of the increased axle-loads, heavier containers create a safety problem during their handling in terminals. For these reasons, the proposal to raise the rating of 20-foot containers up to 30 tons was not supported by TC 104.

## *V. Proposal for a new generation of containers*

45. Pressure for the introduction of larger-than-ISO standard containers has been reflected in the work of ISO and an attempt to introduce a new container standard has been made. In 1987, Working Group 4 "Future Containers" (WG4) within TC 104 was reconvened and assigned the task of developing a standard for a new series of containers. According to the to the Group's mandate, this standard should:

(a) Take full advantage of road width limits of 2.6metres (8'06");

(b) Permit a height of up to 2.9 metres (9'06"); and

(c) Allow the upper limit and intermediate sizes of container lengths to be optimized.

46. However, subsequent meetings of this group revealed the complexity of the problem and the difficulty in finding a universally acceptable solution. At the meeting of TC 104 in London (1989), no agreement was reached within WG4 regarding the length and width of the future generation containers. Moreover, it was generally agreed that the work in progress within WG4 should be limited to the exploratory stage until a more thorough cost/benefit analysis could be made of the consequences of a future generation of containers. As a result of its discussion, TC 104 adopted a resolution stipulating that:

(a) "WG4 shall develop guidelines on technical matters relating to future containers;

(b) WG4 shall study dimensions and ratings, corner fittings, base structure and tunnel requirements;

(c) In its review of container widths, WG4 will continue to consider 2.6m as as well as 2.5m widths;

(d) A full and worldwide economic evaluation for the requirements of future containers will be requested of the Economic and Social Council and its subordinate bodies such as the regional Economic Commissions, UNCTAD and all relevant non-governmental organizations."

47. Notwithstanding this resolution WG4 has not limited its work to purely exploratory exercises but has developed a technical report entitled "Future wide-body containers". Though this document was not intended to be regarded as an international standard, it nevertheless, did propose "a prospective standard for provisional application" for a period of not more than two years after its official publication by ISO. After this probationary period, during which "information and experience of its use in practice may be gathered", it may be extended for another two years, *converted into an international standard*, or withdrawn.

48. This technical report has proposed the following main external dimensions for future generation containers:

| | |
|---|---|
| Height: | 2,896 mm ( 9 feet 6 inches) |
| | 2,591 mm ( 8 feet 6 inches) |
| Length: | 7,430 mm (24 feet) |
| | 14,935 mm (49 feet) |
| Width: | 2,595 mm ( 8 feet 6 inches). |

These parameters differed from those proposed by the regional standardization bodies, which had been based, in general, on units already in operation.

49. In view of the massive opposition voiced before and during the sixteenth session of TC 104, the WG4 document was not adopted for publishing as an ISO technical report. Indeed, as all the previous changes in international standards on container dimensions had been of an evolutionary character, and did not influence the interchangeability of containers with those of the existing standard, the proposed wide-body containers with a different base configuration would be incompatible with elements in the existing transport chain, including infrastructure of inland transport and ports. These containers do not exist in reality and, as experience has shown in relation to the existing larger-than-ISO standard containers, they could not be easily accommodated by existing transport systems in many countries. Moreover, the proposed parameters of the new generation containers would not benefit the users and manufacturers of the existing fleet of non-ISO containers.

50. The United States Technical Advisory Group for Standardization of Freight Containers has proposed its new standard "Requirements for domestic dry van cargo containers", with the following parameters:

| | |
|---|---|
| Height: | 2.9 metres ( 9 feet 6 inches) |
| Width: | 2.6 metres ( 8 feet 6 inches). |
| Length: | 40 foot |
| | 45 foot |
| | 48 foot |
| | 53 foot |
| Maximum gross mass: | 67,000 pounds (30,481 kg). |

The arrangement of handling appertures of these containers corresponds to the arrangement of corner fittings of 40-foot ISO containers.

51. In Europe, ISO containers are, in general, used only in connection with maritime transport. The development of combined road-rail transport on the European continent has led to the introduction of specialized transport equipment intended for use in national and international movements of goods purely in inter-European traffic, the inland container and swap-body, adapted to

accommodate side-by-side two pallets widely used by the European railways. According to a definition given by the Group of Experts on Combined Transport of the Economic Commission for Europe (ECE) "a swap-body is a container designed especially for combined road and rail transport which, however, cannot be stacked and cannot be lifted by its top."

52. The Technical Committee 119 "Swap bodies for combined goods transport road/rail" of the European Committee for Standardization (CEN) has been working for some time on standardization of the equipment used for combined rail/road transport in Europe. The dimensions for general purpose swap-bodies, proposed by this Committee, are reproduced in table 4.

**Table 4**

Proposed dimensions of European swap-bodies

| Type | Length mm | Width mm | Height mm |
|---|---|---|---|
| A 1219 | 12,192 | 2,500 | 2,670 |
| A 1250 | 12,500 | 2,500 | 2,670 |
| A 1360 | 13,600 | 2,500 | 2,670 |
| B 912 | 9,125 | 2,500 | 2,670 |
| B 1035 | 10,350 | 2,500 | 2,670 |
| C 715 | 7,150 | 2,500 | 2,670 |
| C 745 | 7,450 | 2,500 | 2,670 |
| C 782 | 7,820 | 2,500 | 2,670 |

*Note:* Swap-bodies of class C are equipped with bottom fitting positions according to the specification for IC (20-foot) ISO containers.

*Source:* *Impact of containers larger than today on world trade and transport* (Report of the Studiengesellschaft für den kombinierten Verkehr e.V., Francfurt/Main, September 1990).

53. Inland containers are in use primarily by the European railways. They have dimensional characteristics corresponding to ISO 668 standard (except for the width, which is 2,500 mm to accommodate two side-by-side railway pallets) and are equipped with side doors permitting their stripping without unloading them from the wagon. Swap-bodies have been developed according to the requirements of road transport with the width 2,500 mm and a length permitting the full use of the dimensional pattern offered by a road train. This equipment is designed for inland transportation and so its standardization cannot influence the ISO standards which have worldwide application.

## *VI. Correspondence between sizes of containers and pallets*

54. Domestic and regional distribution systems, even before the introduction of the present ISO standards for containers, have been based on the use of pallets. In Europe, there are two prevailing pallet dimensions: industrial 1,000 × 1,200 mm and 800 × 1,200 mm widely used by railways and retail distribution systems. The packaging industry has developed a modular system of packages based on the 400 × 600 mm module, which was recognized as the basic module by ISO. In the United States several different standard sizes of unit loads and different sizes of pallets and slip sheets are currently in use, but the 800 × 1,200 mm pallet, the most popular in Europe, is not used at all.

55. The ISO Technical Committee 51, dealing with pallets for the unit load method of material handling, in its ISO 3676 standard, has adopted, as a preferred, a unit load of 1,000 × 1,200 mm, based on a pallet of the corresponding dimensions. This standard also recognizes 800 × 1,200 mm and 1,140 × 1,140 mm pallets. The last plan dimension is derived from the minimum internal width of ISO standard freight containers (2,330 mm).

56. As regards the different sizes of pallets in use in Europe and the United States, the correspondence between the dimensions of pallets and containers is not very significant for international

maritime trade. The vast majority of containers in intercontinental trades are loaded with different goods without the use of pallets. Shippers have adapted their consignments in a way that efficiently fits into ISO standard containers without wasting internal space.

57. In this respect, already in 1969 a conclusion has been drawn up at an international level, whereby among the three elements of the transport chain - package, pallet and container - the one most difficult and the most expensive to change would be *the dimensions of containers*. The unit load sizes chosen should fit the freight containers; the transport packages sizes and the pallet sizes should fit the unit load sizes. What had been proposed in relation to the future generation containers was quite contrary to the spirit of this conclusion. It was an attempt to replace the present global container system by a new one based on modules having regional application.

## *VII. Conclusion*

58. The discussion of the problems of container dimensions under way in many international organizations, ECE, ESCAP and other United Nations regional commissions, the European Conference of Ministers of Transport (ECMT), the European Communities as well as in non-governmental professional organizations (in particular, ICHCA) has revealed that most countries of the world are not ready for a change in the existing international container standards.

59. On the regional level, operators have been introducing loading units of bigger dimensions in order to meet specific requirements of trades and logistics systems within the limits permitted by existing regulations. These limits may be extended only with costly adaptation of infrastructure and/or the necessity to introduce special rolling stock to permit the movement of bigger containers and swap-bodies. In each case a cost/benefit analysis, as well as a study of the social and environmental impact should be made to evaluate the expediency of introducing changes.

60. The present situation in developing countries precludes them adapting their transport systems to bigger container dimensions. Nor do their economies and trades require the introduction of new container sizes. At its fourteenth session, the UNCTAD Committee on Shipping expressed reservations about the introduction of non-ISO standard containers. Operators from developed countries pressing for the use in developing countries of containers bigger than the present ISO standard size should be aware of this situation and of the cost effect involved in the use of such containers for the transport systems of developing countries and these operators should be prepared to bear the costs.